Effects of Aspirin on Emotional Responses and Emotion Enhanced Memory

Research Thesis

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By

Zachary Weisenseel

The Ohio State University

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Project Advisor: Baldwin Way, PhD.

Abstract

The over-the-counter, pain-relieving drugs acetaminophen and ibuprofen have previously been shown to have effects on emotion. Specifically, these drugs cause the blunting of evaluations and reactions to both positive and negative stimuli (Durso, Luttrell, & Way, 2015; Keaveney, Peters, & Way, under review). In order to identify the biochemical mechanism underlying these emotion blunting effects, we proposed to study the effects of the drug Aspirin. These drugs all produce their pain relieving effects by inhibiting the cyclooxygenase (COX) enzyme. However, there are two different isoforms of the enzyme: cyclooxygenase 1 (COX-1) and cyclooxygenase 2 (COX-2). Acetaminophen primarily inhibits COX-2 while ibuprofen is non-selective. Therefore, it is currently unclear whether emotion blunting effects are specific only to the COX-2 isoform, or if both isoforms contribute. The drug Aspirin is also a COX inhibiting drug; however, Aspirin is COX-1 selective. To test whether emotion blunting effects are primarily influenced by COX-2 inhibition, we tested if a 500mg pain-relieving dose of Aspirin influenced responses to psychological tasks. 135 male participants (mean age: 19.20; 58% White, 22% Asian, 5% African American, 4% Hispanic, 9% Multiracial/Other) were randomly assigned to either Aspirin or placebo groups. After 60 minutes of uptake time, participants completed two tasks designed to measure response to and memory of emotional stimuli, respectively. In the first task, participants rated 60 emotionally evocative images for valence (i.e. evaluations) and 60 emotionally evocative images for arousal (i.e. emotional reaction). After a 5-minute distractor task, participants completed a memory task where they were re-presented with 45 images from the prior task as well as 135 new images, in order to determine if Aspirin blunted the enhanced recognition of emotional images. Participants indicated whether each image had been previously viewed in the original task or was a new

image. In contrast to the original hypothesis, Aspirin increased reactions to the negative stimuli and increased overall memory recognition, with the latter effects approaching statistical significance. These results could suggest that COX-1 and COX-2 potentially have opposite roles in emotional responses, with the inhibition of COX-1 causing emotion enhancement (at least towards negative stimuli) and COX-2 inhibition causing emotion blunting.

Introduction

Acetaminophen is found in over 600 medicines and is the active ingredient in the over-the-counter pain-relieving drug Tylenol. It is the most popular over-the-counter form of pain relief in the United States, taken by an estimated 50 million Americans each week (Kaufman, Kelly, Rosenberg, Anderson, & Mitchell, 2002). In addition to these pain-relieving effects, recent research has shown that acetaminophen also blunts responses to both negative and positive emotional images (Durso, Luttrell, & Way, 2015). Further research on another over-the-counter pain-reliever, ibuprofen (Advil), has shown similar emotion blunting effects (Durso, Keaveney, & Way, in preparation). These drugs work by inhibiting the enzyme cyclooxygenase (COX), which synthesizes inflammation causing prostaglandins and platelet aggregation causing thromboxanes (Vane, 2002). However, cyclooxygenase comes in two isoforms: COX-1 and COX-2. Acetaminophen is a preferential COX-2 inhibitor while ibuprofen inhibits both COX-1 and COX-2 isoforms to a similar degree (Warner et al, 1999). It is currently unknown whether the emotion blunting effects caused by these drugs are due to a specific subtype of the enzyme or not. Based on our previous acetaminophen research, a strong case can be made for the role of COX-2 in emotion blunting. The role of COX-1, however, is less clear; since ibuprofen inhibits both COX1-1 and COX-2, we cannot separate out the effects of COX-1. In order to clarify whether emotion blunting effects are subtype specific or not, we therefore decided to test a COX-1 specific inhibitor for potential emotion blunting effects.

Acetylsalicylic acid, commonly known as Aspirin, is a pain-relieving, anti-inflammatory drug, in use for nearly a century and a half, and is the most commonly used drug in the world (Vane, 2002). It is one in a group of drugs known as non-steroidal anti-inflammatory drugs (NSAID) that are used for pain relief and a wide range of illnesses. The mechanism of action for

Aspirin's anti-inflammatory and anti-platelet effects was not identified until 1971, nearly a century after its discovery (Vane, 1971). It works by irreversibly inhibiting COX-1 and only has small effects on COX-2, primarily at high doses (Warner et al., 1999). Thus, because of Aspirin's selectivity in inhibiting COX-1, studying the effects of this drug on emotion could help clarify the role of the cyclooxygenases in emotions. In addition to these theoretical reasons, it is important to study the effects of Aspirin on emotion because of its wide-spread usage where any side effects could have widespread impact.

In addition to its pain-relieving effects when administered at high doses (350-500 mg), low-dose Aspirin (80mg) is taken daily by millions of people each year to help in the prevention of cardiovascular disease (CVD), leading to a reduction in stroke and myocardial infarctions in patients with a history of these issues (Guirguis-Blake, 2015). The positive effects of Aspirin on CVD come from Aspirin's ability to inhibit the production of thromboxanes that contribute to the disease. There is also emerging evidence that Aspirin may be helpful in prevention of cancer relapse, particularly for colorectal cancer (Chan, 2012). Based on the success of these initial trials, multiple clinical trials of Aspirin to prevent relapse of other forms of cancer have been initiated (Thorat and Cuzick, 2013). If successful, these could lead to an even more widespread use of Aspirin. Since Aspirin is already the most commonly used drug in the world and new applications for the drug are still emerging, it is important to study whether the drug may be having psychological effects in addition to these effects on cancer and cardiovascular disease.

Clinical trials have indeed shown that Aspirin may be having psychological effects in addition to its physiological effects, specifically in the domain of emotion. In fact, studies looking at the potential beneficial effects Aspirin may have on depressive symptoms date back to the 1990's (Ketterer, 1996). One recent, small study has shown that Aspirin has beneficial effects

on depressed mood in the context of bereavement. In the study, not only did the bereaved patients on Aspirin report fewer depressive symptoms upon a second visit than the bereaved group not taking Aspirin, but the Aspirin group also had a significantly larger decrease in heart rate after undergoing a separation recognition task compared to placebo (Karl, 2018). Recent studies on Aspirin's effect on bipolar disorder have also shown that Aspirin may enhance remission rate. In one randomized controlled trial of patients with bipolar disorder, it was found that Aspirin led to better response rates than placebo (Savitz, 2018). Since bipolar disorder is characterized by periods of extremely positive emotion in addition to extremely negative emotion, this suggests that Aspirin's emotion altering effects may not be limited to just negative emotions. Taken together, these studies suggest the novel hypothesis that Aspirin may be having effects on both positive and negative emotions.

This thesis will test if the COX-1 inhibitor Aspirin will blunt responses to emotional stimuli in the same manner as acetaminophen and ibuprofen. If results are positive, this would implicate both COX-1 and COX-2 in emotional reactivity. If results are negative, this would imply that COX-2, but not COX-1, is responsible for the emotion blunting effects of these over-the-counter drugs.

As an additional test of the effects of Aspirin on emotionality, participants completed a second task. There have been robust findings that people have a greater ability to recognize emotionally salient images and experiences (Leal et al., 2014; Buchanan & Lovallo, 2001). If Aspirin is in fact blunting reactions to positive and negative stimuli, then it follows that it may reduce the enhanced recognition of these emotionally salient images, as well. Therefore, a memory recognition task was also implemented in order to assess any effects Aspirin may have on the memory recognition of emotionally salient images.

Methods

Participants. 135 male participants (mean age: 19.20; 58% White, 22% Asian, 5% African American, 4% Hispanic, 9% Multiracial/Other) were recruited in exchange for course credit. Women, anyone with a blood coagulation disorder, those at higher risk for intestinal bleeding, and other high-risk groups were not included in the experiment based on safety concerns.

Drug. Capsules containing 500mg Aspirin and identical capsules packed with 500mg microcrystalline cellulose were prepared by Pharmacy Specialists (www.makerx.com), a licensed compounding pharmacy.

Procedure. Participants were randomly assigned to either placebo or 500 mg of Aspirin in a double-blind procedure. Participants were assigned to a personal cubicle where they took either the drug or placebo and then began to fill out background demographic and personality questionnaires (See Appendix for complete questionnaires), which took participants approximately 20-30 minutes to complete. The tasks were not begun until 60 minutes had passed from drug or placebo intake, in order allow sufficient time for Aspirin to be absorbed into the brain (Cryer, 1998; Nagelschmitz, 2014).

Emotional Image Rating Task: Each participant was presented with 120 images, drawn from the previously published stimuli used in Leal et al. (2014), Schaller (2011) and the International Affective Picture System (Lang, 1995), in a pseudo-random order according to the procedures in Durso et al. (2015). Images were pre-categorized on evaluative dimensions corresponding to extremely unpleasant (35 images), moderately unpleasant (15 images), neutral (20 images), moderately pleasant (15 images), and extremely pleasant (35 images). The participants were asked to evaluate 60 of the images on their valence by being asked the

question: “To what extent is this picture positive or negative?” using a 9-point scale with 4 being extremely positive, -4 being extremely negative, and 0 being neither positive nor negative. They were then shown 60 different images, this time being asked: “To what extent does this picture make you feel an emotional reaction?” in order to rate their level of emotional arousal. A similar 9-point scale was used, with 0 being “I feel little emotion” and 8 being “I feel an extreme amount of emotion.” These two blocks were in a consecutive, non-counterbalanced order.

Memory Recognition Task: After completing an approximately 5-minute distractor task, participants were then asked to perform a memory recognition task based on the paradigm in Leal et al. (2014). Participants were shown 180 images and had to classify each as an image that they had seen in the emotional rating task or a new image. Images were divided equally among four different groups: 45 old images that appeared in the emotional rating task, 45 new high similarity lures that looked very closely like images shown in the emotional rating task (ex. an image of a crossing guard, after being shown an image of the same crossing guard from a slightly different angle in the first task), 45 new low similarity lures that looked somewhat like images shown in the emotional rating task (ex. an image of a dirty stall, after being shown an image of a dirty toilet in the first task), and 45 new foils that did not bare any resemblance to images from the emotional rating task (ex. an image of an airplane, after not being shown an image of aircraft in the first task). Each group was evenly composed of 9 images from each extremely unpleasant, moderately unpleasant, neutral, moderately pleasant, and extremely pleasant image category. For analysis, d-prime (d’) scores were then calculated for each participant in each normative rating category. d’ is a measure of a participant’s signal detection ability and is unaffected by response bias. It was calculated by subtracting the z-score of each participant’s hit rate by the z-score of their false alarm rate for each normative rating category.

Saliva Sample: Participants were asked to provide two saliva samples of 1.5 mL in order to measure prostaglandin levels in the saliva. Saliva samples were taken at the beginning of the experiment 5 minutes after the ingestion of drug or placebo, and at the end of the experiment after participants had completed all computerized tasks, approximately 90 minutes after ingestion of drug or placebo.

Results

At the end of the study, participants indicated whether they thought they took Aspirin or placebo without the option to say that they did not know. A chi-square test of independence was performed to examine whether actual treatment predicted participants' perceived treatment. A chi-square test of independence yielded a nonsignificant result, $\chi 2(1, N = 135) = 0.671$, $p = 0.413$. Specifically, 55% of participants who guessed that they took Aspirin were actually in the placebo condition and 52% of participants who guessed they took placebo were actually in the Aspirin condition.

An *a priori* defined reaction time, < 500 msec, was deemed to indicate that the participant was not taking the study seriously. Thus, 3 participants were excluded from the analyses of evaluation ratings for having >3 trials under 500 msec, 9 participants were excluded from the analyses of emotional reaction ratings for having >3 trials under 500 msec, and 11 participants were excluded from the analyses of memory recognition for having >10 trials under 500 msec. The qualitative nature of the results was unchanged.

Evaluations: Because prior work on acetaminophen found that there was an overall reduction in evaluation extremity irrespective of the valence of the stimulus, the extremity of evaluations for the Aspirin and placebo groups were compared. For the 132 participants who

completed the study at the time of analysis, evaluation extremity (absolute value of the distance from the midpoint) to all stimuli was submitted to an independent-samples *t*-test, with treatment as the between-participants factor. There was no significant difference in evaluation extremity between the Aspirin (M = 1.675, SD = 0.426) or placebo (M = 1.624, SD = 0.413) groups, $t(130) = 0.702$, $p = 0.484$ (Fig. 1).

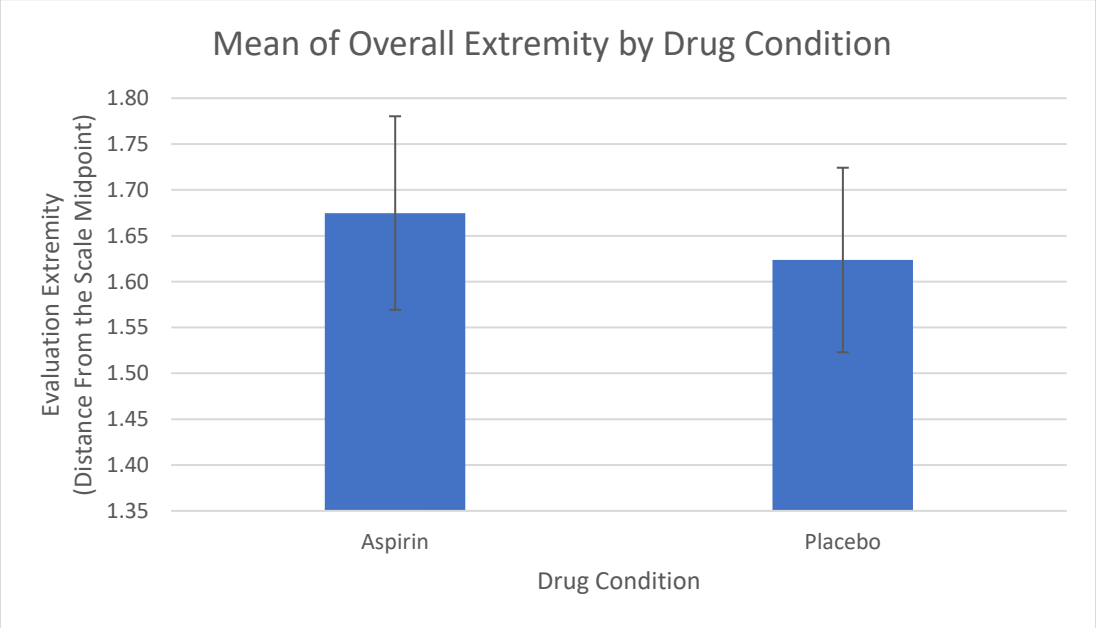

Fig 1. Mean evaluation extremity as a function of treatment condition. Evaluation extremity was indexed by calculating the mean rating of stimuli and then determining the distance of that rating from the scale midpoint. Error bars represent 95% confidence intervals.

Next, to determine if the effect of Aspirin was different as a function of the valence of the stimulus, participants' raw evaluations were then submitted to a 2 (treatment: Aspirin, placebo) × 5 (normative rating: extremely unpleasant, moderately unpleasant, neutral, moderately pleasant, extremely pleasant) mixed-model ANOVA. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(9) = 181.806$, $p < .001$. Because the epsilon value was less than or equal to 0.75 ($\varepsilon = 0.549$), degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity. A main effect of normative rating was found, $F(2.141, 278.332) =$

1471.445, $p < .001$, $\eta p^2 = 0.919$. As expected, participants rated extremely unpleasant pictures more negatively and extremely pleasant pictures more positively in a linear fashion, consistent with normative ratings of the stimuli. The main effect of treatment was close to, but did not meet, significance, $F(1,130) = 2.792$, $p = 0.097$, $\eta p^2 = 0.996$. The Aspirin condition had lower ratings ($M = 5.021$ $SD = 0.043$) than the placebo condition ($M = 5.121$ $SD = 0.042$). The interaction of normative rating and drug condition was non-significant, $F(2.141, 278.332) = 1.461$, $p = 0.233$, $\eta p^2 = 0.011$ (Fig 2).

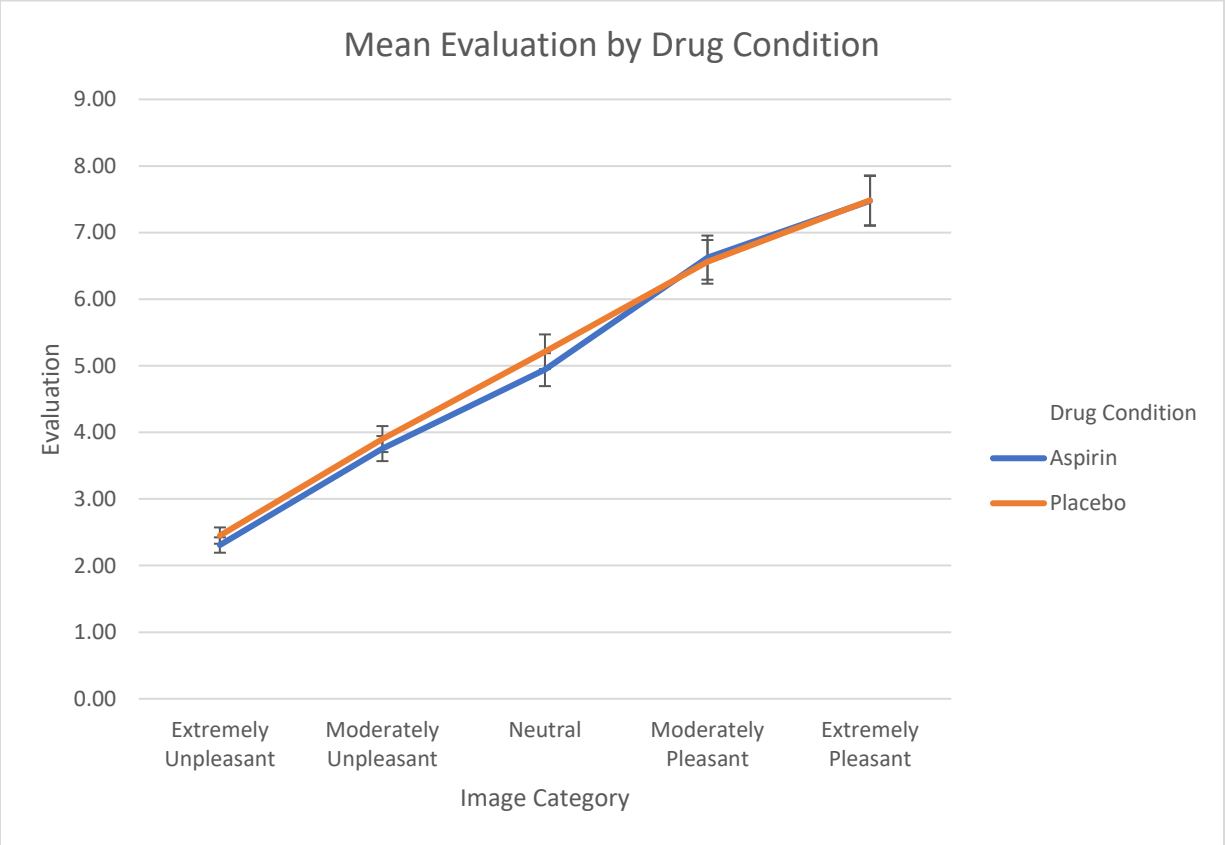

Fig 2. Mean evaluation of stimuli as a function of normative-rating category and treatment condition. Error bars represent 95% confidence intervals.

Contrast analyses showed that participants who took Aspirin rated neutral stimuli ($M =$ 4.942, SD = 0.066) significantly ($t(130) = -2.925$, $p = 0.004$) more negatively than participants

who received placebo (*M* = 5.210, SD = 0.065). Participants who took Aspirin (*M* = 3.757, SD = 0.084) also tended to rate moderately unpleasant images more negatively compared with participants who received placebo (*M* = 3.900, *SD* = 0.083), *t*(130) = -1.205, *p* = 0.230. Additionally, participants who took Aspirin (*M* = 2.309, *SD* = 0.069) tended to rate extremely unpleasant images more negatively than participants on placebo (*M* = 2.450, *SD* = 0.068), *t*(130) = -1.471, p = 0.144. However, both of these differences were not statistically significant.

Emotional Arousal: Because prior work on acetaminophen found that there was an overall reduction in emotional arousal irrespective of the valence of the stimulus, the overall arousal for the Aspirin and placebo groups were compared. Participants' overall emotional arousal to all stimuli was submitted to an independent-samples *t*-test, with treatment as the between-participants factor. Results showed no difference in emotional arousal between the Aspirin (*M* = 3.952, *SD* = 1.215) and placebo (*M* = 3.966, *SD* = 1.085) groups, *t*(124) = -0.67, *p* = 0.947 (Fig 3).

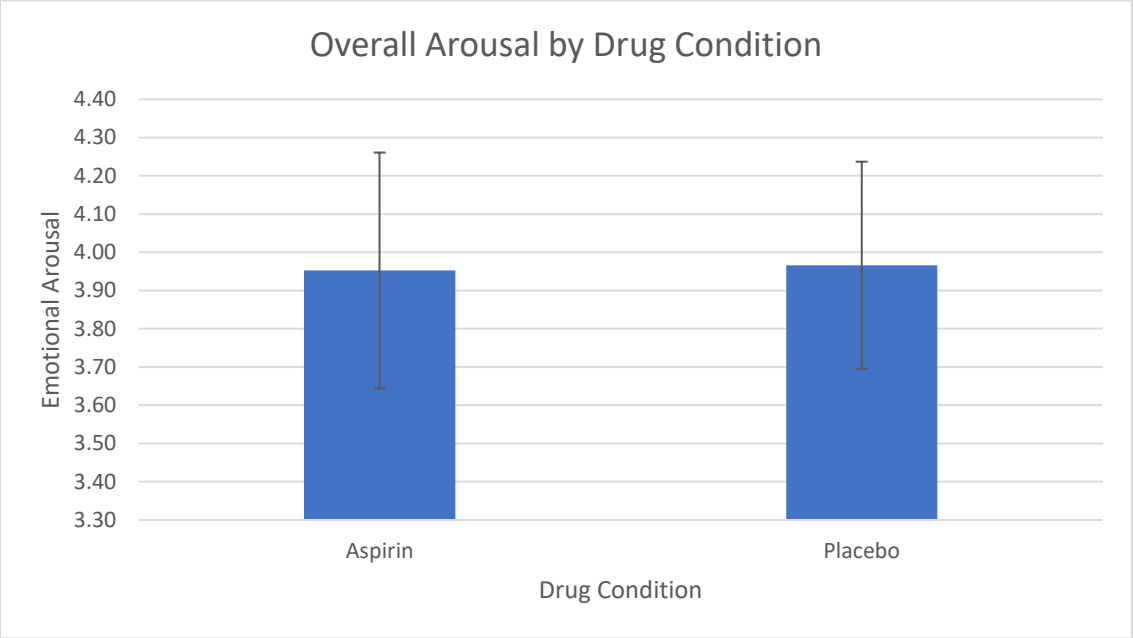

Fig 3. Mean rating of emotional arousal toward all stimuli as a function of treatment condition. Error bars represent 95% confidence intervals.

Next, we submitted participants' emotional arousal ratings within each of the five normative categories to the same 2 × 5 mixed-model ANOVA used to analyze their evaluations. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(9) = 54.432$, $p < .001$, so degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($\varepsilon = 0.883$). A main effect of normative rating was obtained, $F(3.530, 437.722) = 253.085$, $p < .001$, $\eta p^2 = 0.671$. Specifically, participants expressed higher emotional arousal toward stimuli that were normatively more extreme in valence, with the highest arousal toward extremely unpleasant and extremely pleasant stimuli, and the lowest arousal toward neutral stimuli. There was no main effect of drug condition, $F(1, 124) = 0.004$, $p = 0.947$, $\eta p^2 < 0.001$. The interaction of normative category and drug condition was close to, but did not reach, significance, $F(3.530, 437.722) = 2.363$, $p = 0.060$, $\eta p^2 = 0.019$ (Fig 4).

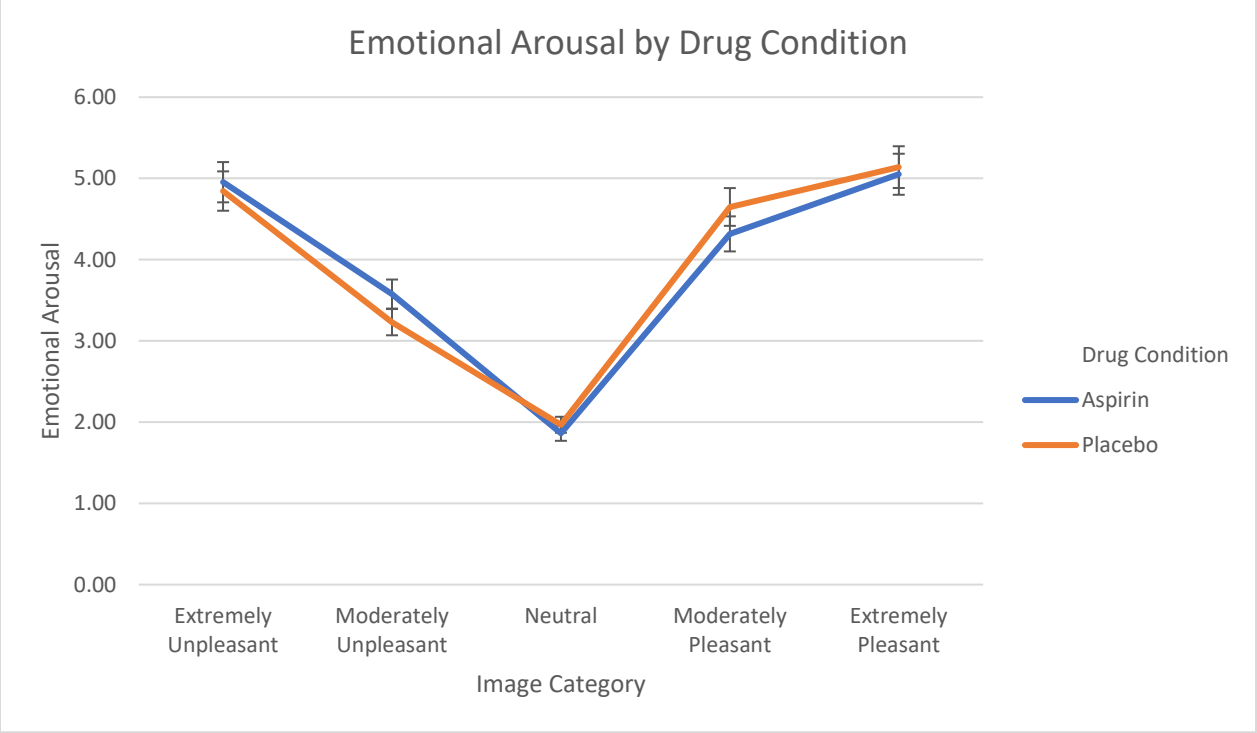

Fig 4. Mean rating of emotional arousal toward stimuli as a function of normative rating category and treatment condition. Error bars represent 95% confidence intervals.

Contrast analyses indicated that participants who received Aspirin tended to rate moderately unpleasant stimuli (M = 3.577, SD = 0.194) as more arousing than participants on placebo (M = 3.230, SD = 0.191) , $t(124) = 1.272$, $p = 0.206$. Participants on Aspirin rated moderately pleasant images (M = 4.317, SD = 0.200) as less arousing than participants on placebo (M = 4.648, SD = 0.197) , $t(124) = -1.181$, $p = 0.240$. These results did not reach statistical significance. Further, participants on Aspirin tended to rate extremely unpleasant images (M = 4.953, SD = 0.176) as more arousing than participants on placebo (M = 4.845, SD = 0.173), $t(124) = 0.442$, $p = 0.659$, and extremely pleasant images (M = 5.051, SD = 0.198) as less arousing than participants on placebo (M = 5.139, SD = 0.195), $t(124) = 0.442$, $p = 0.725$. These results, however, were non-significant.

Memory Recognition: One of the goals of this task was to determine if Aspirin decreased the emotional enhancement of memory, so the first thing we wanted to establish is if there was an emotional enhancement of memory effect irrespective of drug condition. Participant's d' scores were submitted to a paired samples t-test to compare overall recognition of neutral images and extremely unpleasant images. Extremely unpleasant images had a significantly higher recognition than neutral images, $t(123) = 4.31$, $p < 0.0001$ (Fig 5).

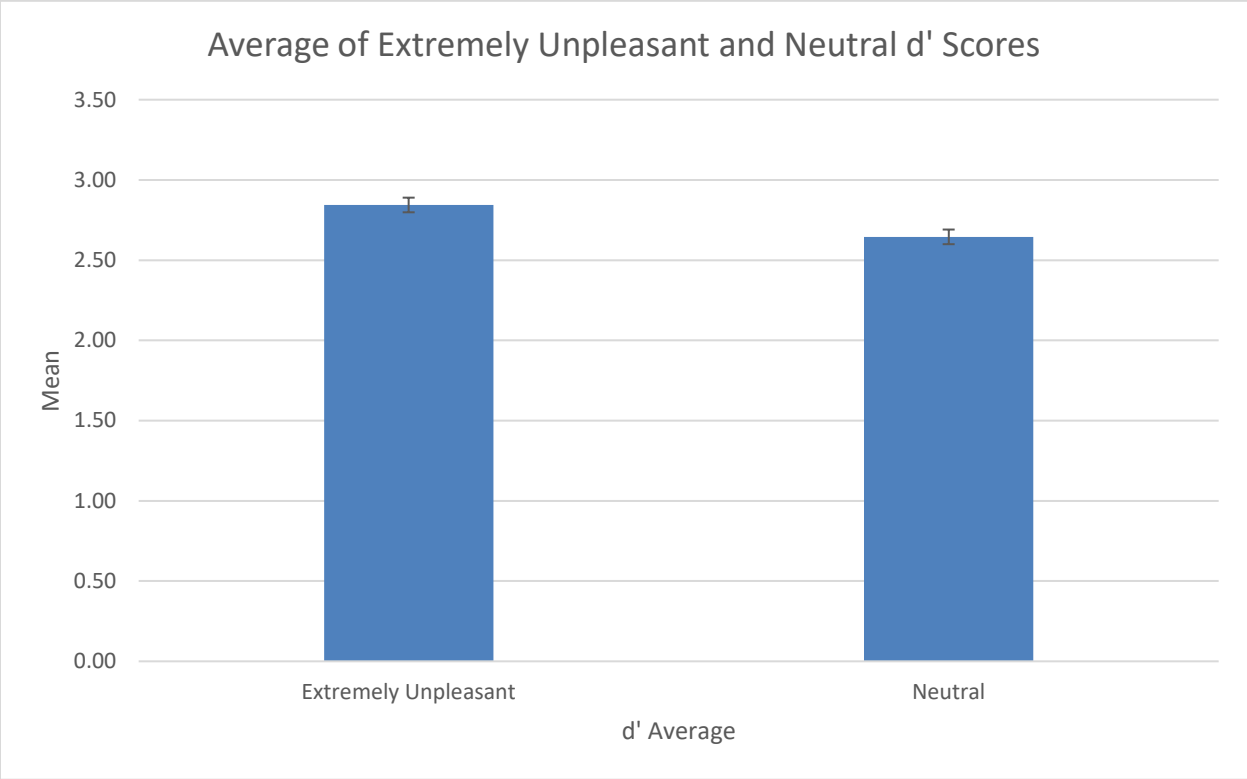

Fig 5. Average d' scores in the extremely unpleasant and neutral categories for all participants.

Participants' overall average d' scores were then submitted to an independent-samples *t*-test, with treatment as the between-participants factor in order to determine of there was an effect of drug condition. Results showed no significant difference between the average recognition of the Aspirin and placebo groups, $t(122) = 1.539$, $p = 0.126$ (Fig 6).

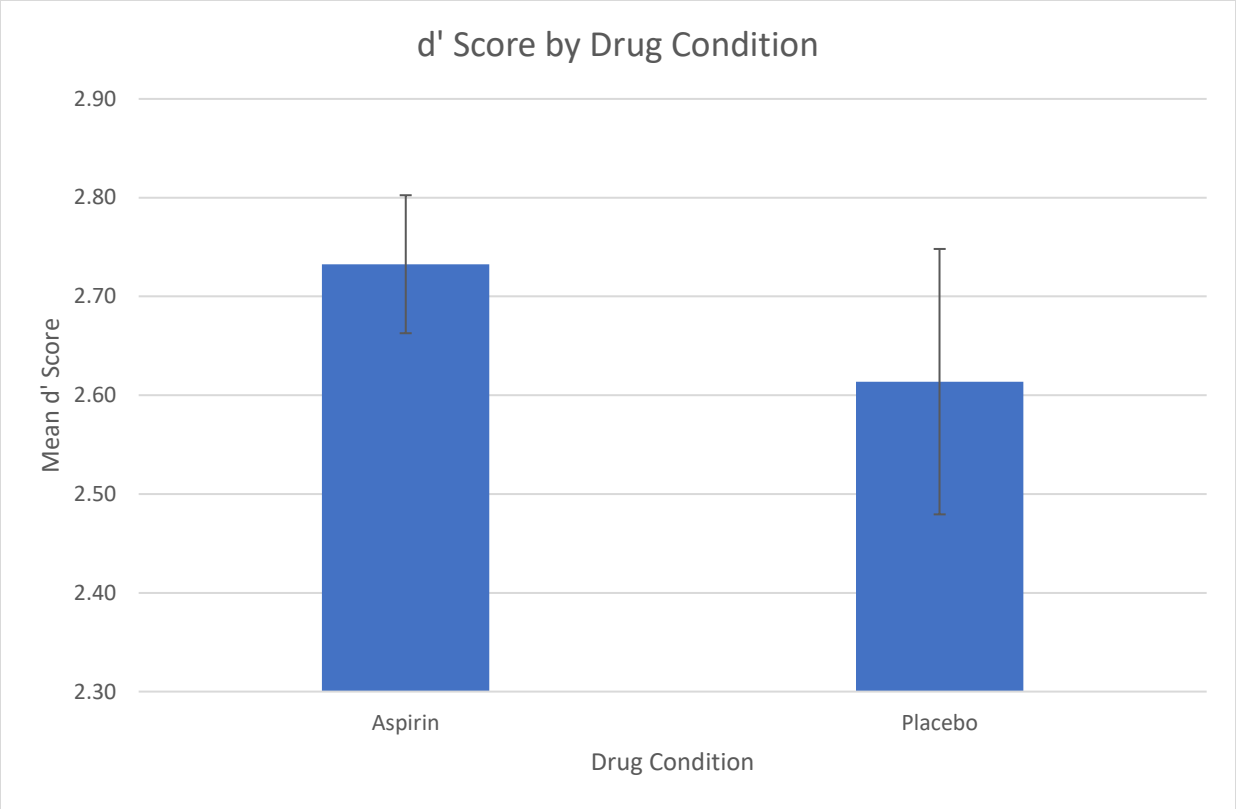

Fig 6. Mean d' score for all stimuli as a function of treatment condition. Error bars represent 95% confidence intervals.

We then submitted participants' d' scores as categorized by their neutral, moderate, or extreme normative ratings to a 2 (treatment: Aspirin, placebo) × 3 (image category: neutral, moderate, or extreme) mixed-model ANOVA, with treatment as a between-participants factor and image category as a within-participants factor. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 7.989$, $p = 0.018$, so degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($\varepsilon = 0.962$). A main effect of extremity was found, $F(1.924, 234.723) = 10.657$, $p < 0.001$, $\eta p^2 = 0.080$. Specifically, moderate images had the lowest recognition ($M = 2.587$, $SD = 0.045$), followed by neutral images ($M = 2.646$, $SD = 0.045$), and then extreme images with the greatest recognition ($M = 2.773$, $SD = 0.040$). There was no main effect of drug condition, $F(1,122) = 1.867$, $p = 0.174$, $\eta p^2 = 0.015$, nor an

interaction between extremity and drug condition, $F(1.924, 234.723) = 1.294$, $p = 0.275$, $\eta p^2 = 0.010$ (Fig 7).

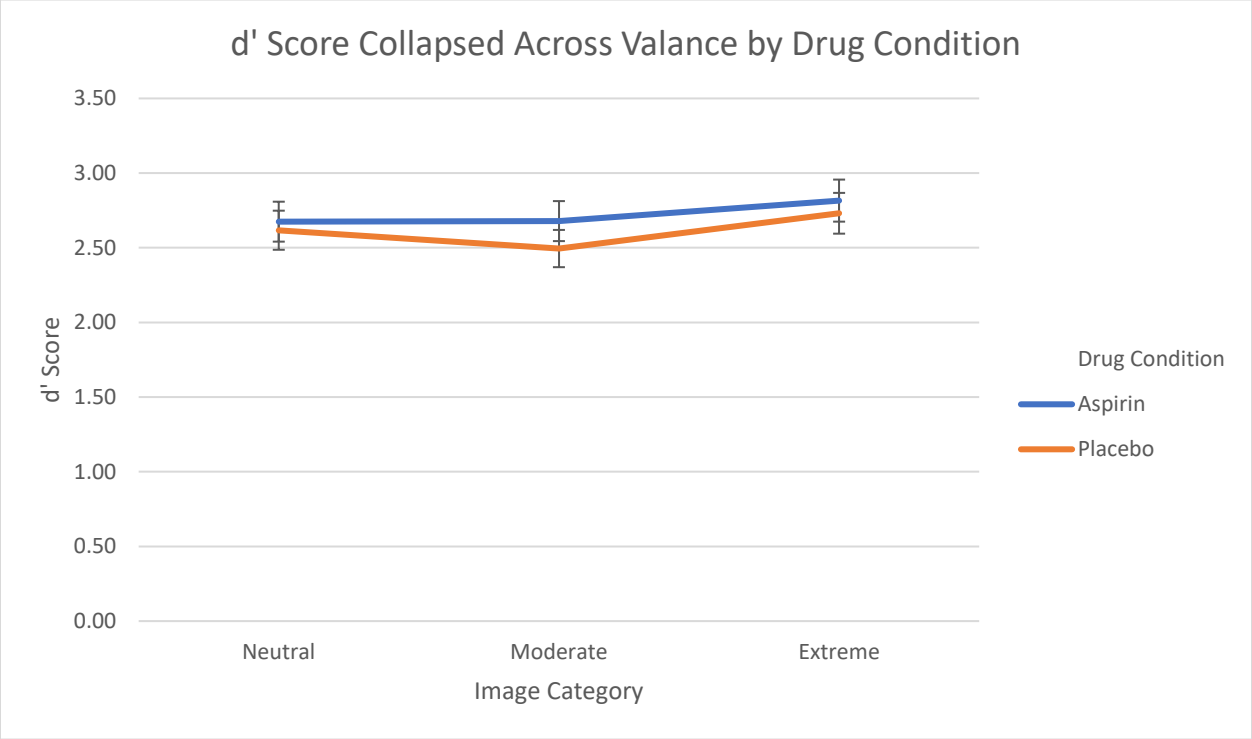

Fig 7. Mean d' score of all stimuli as a function of image category (collapsed across valence) and treatment condition. Error bars represent 95% confidence intervals.

Finally, participants' d' scores within each of the five normative categories were submitted to the same 2 × 5 mixed-model ANOVA used to analyze their evaluations and emotional arousal. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(9) = 17.198$, $p < .046$, so degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($\varepsilon = 0.975$). Results showed a main effect of image category, $F(3.900, 475.826) = 15.931$, $p < 0.001$, $\eta p^2 = 0.115$. Specifically, participants had the least recognition for moderately unpleasant images, followed by neutral, extremely pleasant, moderately pleasant, and then extremely unpleasant images, which were recognized the best. There was a close to, but non-significant effect of drug condition, $F(1,122) = 2.369$, $p = 0.126$, and no interaction of

normative category and drug condition, $F = (3.900, 475.826) = 0.850$, $p = 0.492$, $\eta p^2 = 0.007$ (Fig 8).

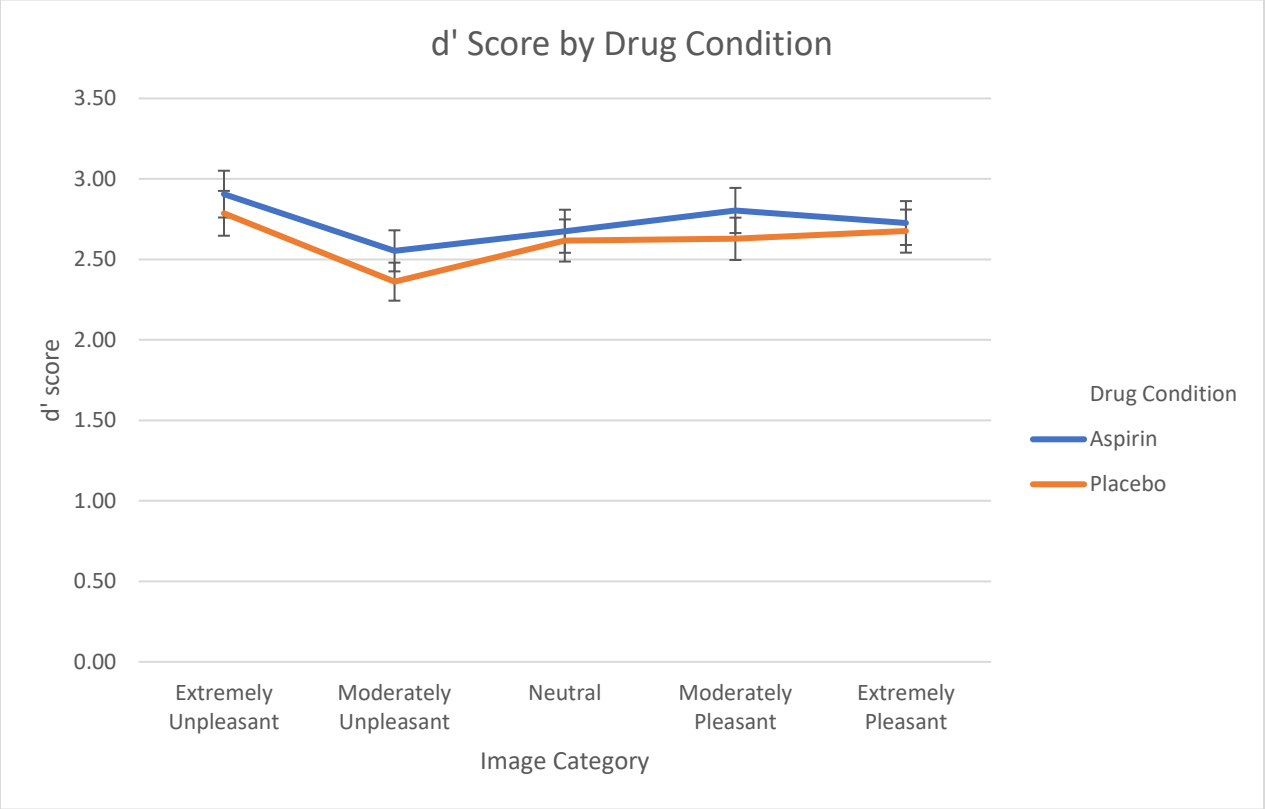

Fig 8. Mean d' score of all stimuli as a function of normative-rating category and treatment condition. Error bars represent 95% confidence intervals.

Contrast analyses showed that participants who took Aspirin had a significantly better recognition of moderate images ($M = 2.678$, SD = 0.064) than participants who took placebo ($M = 2.495$, SD = 0.062), $t(122) = 2.061$, $p = 0.041$. Though the difference in recognition of moderately pleasant (Aspirin: $M = 2.804$, $SD = 0.072$; placebo: $M = 2.628$, $SD = 0.069$), $t(100.361) = 1.795$, $p = 0.076$, and moderately unpleasant (Aspirin: $M = 2.553$, $SD = 0.078$; placebo: $M = 2.362$, $SD = 0.076$), $t(122) = 1.765$, $p = 0.080$, images were not statistically significant on their own. Participants who took Aspirin had no significant difference in the recognition of extreme images ($M = 2.816$, $SD = 0.057$) when compared with placebo ($M = 2.73$,

SD = 0.055), *t*(99.135) = 1.084, *p* = 0.281. However, there was a greater difference between Aspirin (*M* = 2.905, *SD* = 0.062) and placebo (*M* = 2.786, *SD* = 0.060) in the extremely unpleasant category *t*(103.877) = 1.397, *p* = 0.165, than in the extremely pleasant category (Aspirin: *M* = 2.786, *SD* = 0.068; placebo: *M* =2.676, *SD* = 0.066), *t*(105.880) = 0.535, *p* = 0.593.

Correlation and Mediation Analyses: In order to determine if there was a relationship between emotional ratings and memory recognition, specifically if images rated as more emotional were remembered better, a correlation analysis was performed. For extremely unpleasant stimuli, there was a significant correlation between evaluations and d', *r*(122) = 0.181, p = 0.046, but there was not a relationship for the arousal ratings and d', r (120) = 0.026, p = 0.777. There was not a relationship between d' and evaluations or arousal ratings for any of the other categories of stimuli, (p's > .200).

Finally, to determine if the relationship between Aspirin and memory (i.e. d') for the extremely unpleasant stimuli was explained by the magnitude of self-reported evaluations or arousal, a mediation analysis was performed using Model 4 in the PROCESS macro for SPSS (Hayes, 2012) with 5000 bootstrapping samples to construct bias-corrected 95% confidence intervals. The indirect effect of drug condition on d' was not significant for evaluations (-.0176, .0605) or arousal (-.0185, .0128).

Saliva Samples: Saliva samples are yet to be analyzed, but we expect to find a decrease in prostaglandin levels between the first and second sample in the Aspirin group. Additionally, we expect to see no difference between the first and second sample in the placebo group. This salivary assay will confirm drug effectiveness.

Discussion

Prior work has shown that the effect size of acetaminophen on emotional reactions is around a d of 0.4, which indicates that a samples size of 200 individuals is necessary to have the desired power of 0.8 to detect a significant effect. Thus, the originally intended goal in our preregistration (clinicaltrials.gov: NCT04146532). Therefore, this study is currently underpowered due to our insufficient sample size. Experimentation had to be ended early due to the outbreak of COVID-19, and as a result further participants cannot be run for an undetermined amount of time. While precise conclusions cannot be made at this time due to our small sample size, potentially interesting trends are emerging in the data. Though most analyses failed to reach significance, some came close to it and they offer us interesting new hypotheses going forward.

This study shows that Aspirin does not have an emotion blunting effect on positive or negative stimuli. This result is in contrast to studies of acetaminophen and ibuprofen's effects, which do show emotion blunting (Acetaminophen: Durso, Luttrell, & Way, 2015; Ibuprofen: Durso, Keaveney, & Way, in preparation). This result provides us with evidence that COX-1 inhibiting drugs are not involved in the blunting of emotional evaluations and emotional reactions. However, our current data suggests that Aspirin may in fact be having the opposite effect, namely enhancing evaluations and reactions to emotional stimuli, specifically negative stimuli. While no effect of Aspirin was seen in the evaluation of moderately pleasant or extremely pleasant stimuli, participants who took Aspirin rated neutral images as significantly more negative than participants on placebo and, while non-significant, participants who took Aspirin rated moderately unpleasant and extremely unpleasant stimuli more negatively than participants on placebo, as well. Participants given Aspirin also tended to have stronger emotional reaction to negative stimuli and a weaker emotional reaction to positive stimuli,

though these results were non-significant. These findings are in agreement with recent research done by Bradshaw et. al (In preparation) that has shown that the administration of Aspirin causes an increase in disgust sensitivity, with participants given Aspirin rating disgust images as more negative than participants on placebo. Altogether, this suggests that Aspirin may be enhancing our emotional reactions to, and evaluations of, negative stimuli, though no solid conclusions can be made at this point. Once further participants are able to be run, more conclusive results can be shown.

Additionally, our findings cannot definitively show whether or not Aspirin is having an effect on the recognition of emotionally salient memory at this point. While currently there is no significant effect of drug condition on memory recognition, our results are close to significance and when collapsed into neutral, moderate, and extreme valances, participants given Aspirin have a significantly higher recognition of moderate images than participants on placebo. This suggests that Aspirin may enhance the recognition of emotionally salient memory, which would be expected if Aspirin is enhancing reactions to, and evaluations of, emotional stimuli. A correlation analysis showed that there was a significant relationship between the evaluations of extremely unpleasant images and the memory recognition of those extremely unpleasant images, however no other correlations were found between memory recognition and normative rating categories. Additionally, a mediation analysis showed that Aspirin's effects on emotional ratings are not driving the relationship between Aspirin and memory recognition. The memory recognition task implemented in this experiment was a novel measure that was not previously performed in the studies our lab has conducted on acetaminophen or ibuprofen. Future research on acetaminophen and ibuprofen, and continuing research on Aspirin, will need to be conducted

in order to determine what effects, if any, they have on the recognition of emotionally salient images and how emotional ratings may affect this relationship.

Some limitations of our work should be noted. As stated before, this study is currently underpowered, so no strong conclusions about Aspirin's effects on emotional reactions to, and evaluations of, emotional stimuli, or its effect on memory recognition can be drawn at this point. Further, previous studies have indicated Aspirin's role in blunting emotions (Ketterer, 1996; Karl, 2018; Savitz, 2018); however, this study as well as the work by Bradshaw et al. (In preparation) suggests that Aspirin does not have emotion blunting effects, and may in fact enhance emotional reactions and evaluations. Future work will be necessary in order to determine Aspirin's potential psychological effects. For the memory recognition data, while recognition of extremely unpleasant images was enhanced compared to the other categories, we did not see the enhancement in the recognition of extremely pleasant images that we expected to, and the moderately unpleasant images had a lower recognition than was expected, as well.

While this study shows that the COX-1 inhibitor Aspirin does not have blunting effects on emotion, it does suggest that Aspirin may have enhancing effects on the evaluation and emotional arousal of negative stimuli. This suggests that COX-1 and COX-2 potentially have opposite roles in emotional evaluation and emotional arousal, with the inhibition of COX-1 causing emotion enhancement (at least towards negative stimuli) and COX-2 inhibition causing emotion blunting. Alternatively, these differential effects may be due to effects of these drugs on neurochemical pathways other than COX-1 or COX-2. For example, acetaminophen has effects on multiple drug systems including the cannabinoid, serotoninergic, and vanilloid (Graham, 2013). Once the saliva samples are analyzed, determining if the change in salivary prostaglandin

levels is related to the emotional changes will help to clarify a role for the prostaglandin system in mediating these effects.

Even if further research shows Aspirin does not have an effect on emotional evaluation or arousal, this research suggests the role of COX-2 in the blunting of emotional evaluations and arousal and future studies will need to be conducted in order to determine how COX-2 produces this psychological effect. However, this research shows that further research into the potential psychological side effects of Aspirin, especially in the domain of emotion, is needed. Since Aspirin has such widespread and still growing usage, it is important to understand all of the effects it has, not only physically, but psychologically, as well. Our data shows that additional research into Aspirin's effects on emotional ratings and memory recognition may result in an interesting new understanding of how Aspirin effects the psychology of the people who use it, including the millions of people around the world who take the drug daily.

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Appendix

Images used in Emotional Image Rating Task

All images from both the emotional image rating task and the memory recognition task were drawn from the previously published stimuli used in Leal et al. (2014), Schaller (2011) and the International Affective Picture System (Lang, 1995). The table below lists the set, image number, and valance category for each image used.

Image Set	Image Number	Valance Category
International Affective Picture System	1052	Extremely Unpleasant
International Affective Picture System	1111	Extremely Unpleasant
International Affective Picture System	1201	Extremely Unpleasant
Leal et al. (2014)	10040a	Extremely Unpleasant
Leal et al. (2014)	10041a	Extremely Unpleasant
Leal et al. (2014)	10044a	Extremely Unpleasant
Schaller (2011)	d6	Extremely Unpleasant
Schaller (2011)	d2	Extremely Unpleasant
Schaller (2011)	d4	Extremely Unpleasant
Schaller (2011)	d5	Extremely Unpleasant
Leal et al. (2014)	10012a	Extremely Unpleasant
Leal et al. (2014)	10023a	Extremely Unpleasant
Leal et al. (2014)	10032a	Extremely Unpleasant
Leal et al. (2014)	10048a	Extremely Unpleasant
International Affective Picture System	6560	Extremely Unpleasant
Leal et al. (2014)	10035a	Extremely Unpleasant
Leal et al. (2014)	10002a	Extremely Unpleasant
Leal et al. (2014)	10009a	Extremely Unpleasant
Leal et al. (2014)	10025a	Extremely Unpleasant
Leal et al. (2014)	10031a	Extremely Unpleasant
Leal et al. (2014)	10033a	Extremely Unpleasant
International Affective Picture System	3010	Extremely Unpleasant
International Affective Picture System	3061	Extremely Unpleasant
International Affective Picture System	3130	Extremely Unpleasant
International Affective Picture System	3140	Extremely Unpleasant
International Affective Picture System	3150	Extremely Unpleasant
Leal et al. (2014)	10038a	Extremely Unpleasant
Leal et al. (2014)	10039a	Extremely Unpleasant
Leal et al. (2014)	10001a	Extremely Unpleasant
Leal et al. (2014)	10010a	Extremely Unpleasant
Leal et al. (2014)	10015a	Extremely Unpleasant
Leal et al. (2014)	10019a	Extremely Unpleasant
Leal et al. (2014)	10020a	Extremely Unpleasant
Leal et al. (2014)	10029a	Extremely Unpleasant
Leal et al. (2014)	10005a	Extremely Unpleasant
Schaller (2011)	d10	Moderately Unpleasant

Schaller (2011)	d3	Moderately Unpleasant
International Affective Picture System	3250	Moderately Unpleasant
International Affective Picture System	9594	Moderately Unpleasant
Leal et al. (2014)	10013a	Moderately Unpleasant
Leal et al. (2014)	10043a	Moderately Unpleasant
International Affective Picture System	2457	Moderately Unpleasant
Leal et al. (2014)	10022a	Moderately Unpleasant
Leal et al. (2014)	10028a	Moderately Unpleasant
Leal et al. (2014)	10006a	Moderately Unpleasant
Leal et al. (2014)	10016a	Moderately Unpleasant
Leal et al. (2014)	10021a	Moderately Unpleasant
Leal et al. (2014)	10036a	Moderately Unpleasant
Leal et al. (2014)	10045a	Moderately Unpleasant
Leal et al. (2014)	10046a	Moderately Unpleasant
Leal et al. (2014)	20003a	Neutral
Leal et al. (2014)	20010a	Neutral
Leal et al. (2014)	20012a	Neutral
Leal et al. (2014)	20015a	Neutral
Leal et al. (2014)	20016a	Neutral
Leal et al. (2014)	20017a	Neutral
Leal et al. (2014)	20020a	Neutral
Leal et al. (2014)	20022a	Neutral
Leal et al. (2014)	20023a	Neutral
Leal et al. (2014)	20025a	Neutral
Leal et al. (2014)	20026a	Neutral
Leal et al. (2014)	20028a	Neutral
Leal et al. (2014)	20029a	Neutral
Leal et al. (2014)	20031a	Neutral
Leal et al. (2014)	20035a	Neutral
Leal et al. (2014)	20037a	Neutral
Leal et al. (2014)	20038a	Neutral
Leal et al. (2014)	20041a	Neutral
Leal et al. (2014)	20043a	Neutral
Leal et al. (2014)	20048a	Neutral
Leal et al. (2014)	20006a	Moderately Pleasant
Leal et al. (2014)	20007a	Moderately Pleasant
Leal et al. (2014)	20014a	Moderately Pleasant
Leal et al. (2014)	20019a	Moderately Pleasant
Leal et al. (2014)	30009a	Moderately Pleasant
Leal et al. (2014)	30010a	Moderately Pleasant
Leal et al. (2014)	30025a	Moderately Pleasant
Leal et al. (2014)	30030a	Moderately Pleasant
Leal et al. (2014)	30031a	Moderately Pleasant
Leal et al. (2014)	30033a	Moderately Pleasant
Leal et al. (2014)	30034a	Moderately Pleasant
Leal et al. (2014)	30035a	Moderately Pleasant
International Affective Picture System	4800	Moderately Pleasant
Leal et al. (2014)	30039a	Moderately Pleasant
International Affective Picture System	4647	Moderately Pleasant
International Affective Picture System	4220	Extremely Pleasant
International Affective Picture System	4290	Extremely Pleasant
International Affective Picture System	4660	Extremely Pleasant
International Affective Picture System	4670	Extremely Pleasant

International Affective Picture System	4680	Extremely Pleasant
Leal et al. (2014)	30002a	Extremely Pleasant
Leal et al. (2014)	30003a	Extremely Pleasant
Leal et al. (2014)	30005a	Extremely Pleasant
Leal et al. (2014)	30006a	Extremely Pleasant
Leal et al. (2014)	30008a	Extremely Pleasant
Leal et al. (2014)	30011a	Extremely Pleasant
Leal et al. (2014)	30012a	Extremely Pleasant
Leal et al. (2014)	30013a	Extremely Pleasant
Leal et al. (2014)	30015a	Extremely Pleasant
Leal et al. (2014)	30016a	Extremely Pleasant
Leal et al. (2014)	30018a	Extremely Pleasant
Leal et al. (2014)	30019a	Extremely Pleasant
Leal et al. (2014)	30020a	Extremely Pleasant
Leal et al. (2014)	30022a	Extremely Pleasant
Leal et al. (2014)	30023a	Extremely Pleasant
Leal et al. (2014)	30026a	Extremely Pleasant
Leal et al. (2014)	30027a	Extremely Pleasant
Leal et al. (2014)	30028a	Extremely Pleasant
Leal et al. (2014)	30029a	Extremely Pleasant
Leal et al. (2014)	30036a	Extremely Pleasant
Leal et al. (2014)	30040a	Extremely Pleasant
Leal et al. (2014)	30041a	Extremely Pleasant
Leal et al. (2014)	30042a	Extremely Pleasant
Leal et al. (2014)	30045a	Extremely Pleasant
Leal et al. (2014)	30046a	Extremely Pleasant
Leal et al. (2014)	30047a	Extremely Pleasant
Leal et al. (2014)	30049a	Extremely Pleasant
Leal et al. (2014)	30051a	Extremely Pleasant
Leal et al. (2014)	30050a	Extremely Pleasant

Images used in Memory Recognition Task

Image Set	Image Number	Valance Category	Target/Foil/Lure
Leal et. al (2014)	10012a	Extremely Unpleasant	Target
Leal et. al (2014)	10039a	Extremely Unpleasant	Target
Leal et. al (2014)	10041a	Extremely Unpleasant	Target
Leal et. al (2014)	10009a	Extremely Unpleasant	Target
Leal et. al (2014)	10015a	Extremely Unpleasant	Target
Schaller (2012)	d6	Extremely Unpleasant	Target
Schaller (2012)	d5	Extremely Unpleasant	Target
International Affective Picture System	6560	Extremely Unpleasant	Target
Leal et. al (2014)	10005a	Extremely Unpleasant	Target
Leal et. al (2014)	10043a	Moderately Unpleasant	Target
Leal et. al (2014)	10046a	Moderately Unpleasant	Target
Leal et. al (2014)	10022a	Moderately Unpleasant	Target
Leal et. al (2014)	10013a	Moderately Unpleasant	Target
Leal et. al (2014)	10016a	Moderately Unpleasant	Target
Leal et. al (2014)	10036a	Moderately Unpleasant	Target
Schaller (2012)	d3	Moderately Unpleasant	Target
Schaller (2012)	d10	Moderately Unpleasant	Target
International Affective Picture System	2457	Moderately Unpleasant	Target
Leal et. al (2014)	20029a	Neutral	Target
Leal et. al (2014)	20026a	Neutral	Target
Leal et. al (2014)	20025a	Neutral	Target
Leal et. al (2014)	20028a	Neutral	Target
Leal et. al (2014)	20022a	Neutral	Target
Leal et. al (2014)	20003a	Neutral	Target
Leal et. al (2014)	20010a	Neutral	Target
Leal et. al (2014)	20012a	Neutral	Target
Leal et. al (2014)	20017a	Neutral	Target
International Affective Picture System	4647	Moderately Pleasant	Target
Leal et. al (2014)	30034a	Moderately Pleasant	Target
International Affective Picture System	4800	Moderately Pleasant	Target
Leal et. al (2014)	30035a	Moderately Pleasant	Target
Leal et. al (2014)	30010a	Moderately Pleasant	Target
Leal et. al (2014)	20007a	Moderately Pleasant	Target
Leal et. al (2014)	20006a	Moderately Pleasant	Target
Leal et. al (2014)	30009a	Moderately Pleasant	Target
Leal et. al (2014)	30030a	Moderately Pleasant	Target
International Affective Picture System	4220	Extremely Pleasant	Target
Leal et. al (2014)	30003a	Extremely Pleasant	Target
International Affective Picture System	4660	Extremely Pleasant	Target
Leal et. al (2014)	30051a	Extremely Pleasant	Target
International Affective Picture System	4290	Extremely Pleasant	Target
Leal et. al (2014)	30012a	Extremely Pleasant	Target
International Affective Picture System	4670	Extremely Pleasant	Target
Leal et. al (2014)	30018a	Extremely Pleasant	Target
Leal et. al (2014)	30019a	Extremely Pleasant	Target
Leal et. al (2014)	10023c	Extremely Unpleasant	High Similarity Lure
Leal et. al (2014)	10005c	Extremely Unpleasant	High Similarity Lure
Leal et. al (2014)	10035c	Extremely Unpleasant	High Similarity Lure
Leal et. al (2014)	10002c	Extremely Unpleasant	High Similarity Lure

Leal et. al (2014)	10031c	Extremely Unpleasant	High Similarity Lure
Leal et. al (2014)	10001c	Extremely Unpleasant	High Similarity Lure
Leal et. al (2014)	10038c	Extremely Unpleasant	High Similarity Lure
Leal et. al (2014)	10029c	Extremely Unpleasant	High Similarity Lure
Leal et. al (2014)	10025c	Extremely Unpleasant	High Similarity Lure
Leal et. al (2014)	10043c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	10013c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	10046c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	10045c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	10021c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	10022c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	10046c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	10036c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	10006c	Moderately Unpleasant	High Similarity Lure
Leal et. al (2014)	20037c	Neutral	High Similarity Lure
Leal et. al (2014)	20029c	Neutral	High Similarity Lure
Leal et. al (2014)	20025c	Neutral	High Similarity Lure
Leal et. al (2014)	20043c	Neutral	High Similarity Lure
Leal et. al (2014)	20031c	Neutral	High Similarity Lure
Leal et. al (2014)	20035c	Neutral	High Similarity Lure
Leal et. al (2014)	20003c	Neutral	High Similarity Lure
Leal et. al (2014)	20010c	Neutral	High Similarity Lure
Leal et. al (2014)	20015c	Neutral	High Similarity Lure
Leal et. al (2014)	20019c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	30034c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	20014c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	30033c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	30039c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	30035c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	20006c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	30009c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	30010c	Moderately Pleasant	High Similarity Lure
Leal et. al (2014)	30019c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	30013c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	30016c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	30023c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	30046c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	30008c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	30002c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	30005c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	30020c	Extremely Pleasant	High Similarity Lure
Leal et. al (2014)	10032b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10039b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10048b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10031b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10040b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10020b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10012b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10023b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10035b	Extremely Unpleasant	Low Similarity Lure
Leal et. al (2014)	10013b	Moderately Unpleasant	Low Similarity Lure
Leal et. al (2014)	10036b	Moderately Unpleasant	Low Similarity Lure
Leal et. al (2014)	10006b	Moderately Unpleasant	Low Similarity Lure

Leal et. al (2014)	10016b	Moderately Unpleasant	Low Similarity Lure
Leal et. al (2014)	10021b	Moderately Unpleasant	Low Similarity Lure
Leal et. al (2014)	10028b	Moderately Unpleasant	Low Similarity Lure
Leal et. al (2014)	10043b	Moderately Unpleasant	Low Similarity Lure
Leal et. al (2014)	10022b	Moderately Unpleasant	Low Similarity Lure
Leal et. al (2014)	10046b	Moderately Unpleasant	Low Similarity Lure
Leal et. al (2014)	20048b	Neutral	Low Similarity Lure
Leal et. al (2014)	20026b	Neutral	Low Similarity Lure
Leal et. al (2014)	20025b	Neutral	Low Similarity Lure
Leal et. al (2014)	20022b	Neutral	Low Similarity Lure
Leal et. al (2014)	20017b	Neutral	Low Similarity Lure
Leal et. al (2014)	20016b	Neutral	Low Similarity Lure
Leal et. al (2014)	20003b	Neutral	Low Similarity Lure
Leal et. al (2014)	20010b	Neutral	Low Similarity Lure
Leal et. al (2014)	20012b	Neutral	Low Similarity Lure
Leal et. al (2014)	30010b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	20006b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	30030b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	20007b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	20014b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	30031b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	30009b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	30033b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	30035b	Moderately Pleasant	Low Similarity Lure
Leal et. al (2014)	30003b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	30011b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	30040b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	30049b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	30018b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	30029b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	30002b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	30036b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	30026b	Extremely Pleasant	Low Similarity Lure
Leal et. al (2014)	40041a	Extremely Unpleasant	Foil
Leal et. al (2014)	40038a	Extremely Unpleasant	Foil
Leal et. al (2014)	40006a	Extremely Unpleasant	Foil
Leal et. al (2014)	40009a	Extremely Unpleasant	Foil
Leal et. al (2014)	40022a	Extremely Unpleasant	Foil
Leal et. al (2014)	40035a	Extremely Unpleasant	Foil
Leal et. al (2014)	40002a	Extremely Unpleasant	Foil
Leal et. al (2014)	40010a	Extremely Unpleasant	Foil
Leal et. al (2014)	40011a	Extremely Unpleasant	Foil
Leal et. al (2014)	40007a	Moderately Unpleasant	Foil
Leal et. al (2014)	40013a	Moderately Unpleasant	Foil
Leal et. al (2014)	40028a	Moderately Unpleasant	Foil
Leal et. al (2014)	40031a	Moderately Unpleasant	Foil
Leal et. al (2014)	40044a	Moderately Unpleasant	Foil
Leal et. al (2014)	40029a	Moderately Unpleasant	Foil
Leal et. al (2014)	40008a	Moderately Unpleasant	Foil
Leal et. al (2014)	40012a	Moderately Unpleasant	Foil
Leal et. al (2014)	40015a	Moderately Unpleasant	Foil
Leal et. al (2014)	50005a	Neutral	Foil
Leal et. al (2014)	50007a	Neutral	Foil

Leal et. al (2014)	50010a	Neutral	Foil
Leal et. al (2014)	50014a	Neutral	Foil
Leal et. al (2014)	50016a	Neutral	Foil
Leal et. al (2014)	50042a	Neutral	Foil
Leal et. al (2014)	50013a	Neutral	Foil
Leal et. al (2014)	50017a	Neutral	Foil
Leal et. al (2014)	50018a	Neutral	Foil
Leal et. al (2014)	60001a	Moderately Pleasant	Foil
Leal et. al (2014)	60003a	Moderately Pleasant	Foil
Leal et. al (2014)	60011a	Moderately Pleasant	Foil
Leal et. al (2014)	60019a	Moderately Pleasant	Foil
Leal et. al (2014)	60002a	Moderately Pleasant	Foil
Leal et. al (2014)	60004a	Moderately Pleasant	Foil
Leal et. al (2014)	60017a	Moderately Pleasant	Foil
Leal et. al (2014)	60032a	Moderately Pleasant	Foil
Leal et. al (2014)	60041a	Moderately Pleasant	Foil
Leal et. al (2014)	60048a	Extremely Pleasant	Foil
Leal et. al (2014)	60043a	Extremely Pleasant	Foil
Leal et. al (2014)	60038a	Extremely Pleasant	Foil
Leal et. al (2014)	60033a	Extremely Pleasant	Foil
Leal et. al (2014)	60027a	Extremely Pleasant	Foil
Leal et. al (2014)	60010a	Extremely Pleasant	Foil
Leal et. al (2014)	60039a	Extremely Pleasant	Foil
Leal et. al (2014)	60024a	Extremely Pleasant	Foil
Leal et. al (2014)	60020a	Extremely Pleasant	Foil

Questionnaires

Background Measures

Recent Health Behaviors Questionnaire

1.	What is your height? _____feet _____inches
2.	What is your weight? _____ (in pounds)
3.	What time did you go to bed last night? _____
4.	How long (in minutes) did it take you to fall asleep last night? _____
5.	What time did you get up this morning? _____
6.	On a scale of 1 to 10, how well did you sleep? (1=poorly, 10=well) _____
7.	How many hours of actual sleep did you get? (This may be different than the number of hours you spent in bed? _____
8.	Approximately how long ago did you last eat? _____ Was it a (indicate one): Snack Light Meal Full Meal
9.	Have you done any aerobic exercise today? Yes No If yes, how many minutes? _____ If yes, how long ago (in hours)? _____
10.	On an average week, how many days do you do aerobic exercise? _____

11.	When you do exercise, how long do you usually work out? _____ (in minutes)

1.	In general, would you say that your health is (indicate one): Excellent Very Good Good Fair Poor					
	Please answer the following 3 questions by circling a number on the right:	**Strongly Disagree**				**Strongly Agree**
2.	Over the last couple of days, I have not been feeling well.	1	2	3	4	5
3.	Lately, I have been feeling a little under the weather	1	2	3	4	5
4.	I have felt sick within the last week.	1	2	3	4	5
5.	When was the last time you had a cold, flu, dental infection, or other infection? ____Today ____A couple of days ago ____A week ago ____A couple of weeks ago ____A month ago ____A few months ago ____A year or more ago					
6.	Did you seek medical care for any sort of cold, flu, or infection in the last 3 months? Yes No If yes, how many times in the last 3 months did you go to the health center for an illness?_____					
7.	Did you take any over-the-counter or prescription medications for a cold, flu, or any infection in the last 3 months? Yes No					

	If yes, what medications_____
	Please answer the following questions by circling a response on the right:

1. **In the box below, please list all medications AND vitamins or supplements you are currently taking, including pills, patches, lotions or injections. Medications can be prescription medications or over-the-counter medications. Be sure to include the NAME, DOSE, AMOUNT and FREQUENCY you take the medications or supplements, putting a comma between each one. If the medication or supplement does not have a particular dose, please put "NA" after name and before frequency. See examples below.**

Example 1: Oxytrol 3.9 mg 1 patch every 4 days, Femgest progesterone cream no dosage apply to hands once per day, Synthroid 75 mcg 1 pill once per day.

Example 2: Timoptic 0.25% 2 drops per eye twice per day, Saw Palmetto 160 mg 1 pill twice per day, Zocor 20 mg each night.

Example 3: Calcium 333mg/pill 3 pills per day, Vitamin C 500mg 1 pill per day, Vitamin D 1000mg 1 pill per day.

2.	Are you currently taking birth control medication? Yes No
3.	How often do you typically use marijuana? (indicate one) ___ Almost every day ___ At least once a month ___ Several times a week ___ Several times a year ___ At least once a week ___ At least once a year

	___ Several times a month ___ Never					
4.	How long ago did you last use marijuana? (If in the last day, please indicate the number of hours. If not record the number of days, months, or years.) Hours:_____ Days: _____ Months: _____ Years: _____ _____I have never used marijuana.					
5.	How many cigarettes per day do you smoke (indicate one response)? 0 1 to 10 10 to 20 20 to 30 30 or more					
6.	If you smoke, how long has it been since your last cigarette? (Please indicate the number of minutes and hours.) Minutes:_____ Hours: _____					
7.	When was the last time you consumed an alcoholic beverage? (If in the last day, please indicate the number of hours. If not record the number of days, months, or years.) Hours:_____ Days: _____ Months: _____ Years: _____ _____I do not drink alcohol.					
Please answer the following 3 questions by circling a response on the right:						
8.	How often do you have a drink containing alcohol?	Never	Monthly	2 - 4 times a month	2 – 3 times a week	4 or more times a week
9.	How many drinks containing alcohol do you have on a typical	1 or 2	3 or 4	5 or 6	7 to 9	10 or more

	day when you are drinking?					
10.	How often do you have six or more drinks on one occasion?	Never	Less than Monthly	Monthly	Weekly	Daily or almost Daily
11.	Do you have arthritis, rheumatoid arthritis, or joint problems? Yes No					
12.	Do you have arthritis or any immune disorders that might lead to immunodeficiency such as HIV? Yes No					
13.	Do you have any chronic illnesses that affect the endocrine system (e.g Cushing's Disease)? Yes No					
14.	Are you diabetic (Type I or II)? Yes No					

Subjective Socioeconomic Status Measure

Think of this ladder as representing where people stand in the United States.

At the **top** of the ladder are the people who are best off– those who have the most money, the most education, and the most respected jobs. At the **bottom** are the people who are the worst off– who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

Where would you place yourself on this ladder?

Please place a large "**X**" on the rung where you think you stand at this time in your life, **relative to other people in the United States.**

Political Ideology (Wilson, 1968)

G.D. Wilson, J.R. Patterson, A new measure of conservatism, Br. J. Soc. Clin.Psychol. 7 (1968) 264–269.
Mofied by Mills, M., Gonzalez, F. J., Giuseffi, K., Sievert, B., Smith, K. B., Hibbing, J. R., & Dodd, M. D. (2016). Political conservatism predicts asymmetries in emotional scene memory. *Behavioural brain research*, *306*, 84–90.

Indicate your agreement with the following issues:

	strongly disagree with (1)	disagree with (2)	uncertain about (3)	agree with (4)	strongly agree with (5)
school prayer (1)	○	○	○	○	○
pacifism (2)	○	○	○	○	○
stopping immigration (3)	○	○	○	○	○
death penalty (4)	○	○	○	○	○
government-arranged healthcare (5)	○	○	○	○	○
premarital sex (6)	○	○	○	○	○
gay marriage (7)	○	○	○	○	○
abortion rights (8)	○	○	○	○	○
evolution (9)	○	○	○	○	○
biblical truth (10)	○	○	○	○	○
increased welfare spending (11)	○	○	○	○	○
protecting gun rights (12)	○	○	○	○	○
increasing military spending (13)	○	○	○	○	○
government regulation of business (14)	○	○	○	○	○
small government (15)	○	○	○	○	○

foreign aide (16)	○	○	○	○	○
lowering taxes (17)	○	○	○	○	○
stem cell research (18)	○	○	○	○	○
abstinence-only sex education (19)	○	○	○	○	○
allowing torture of terrorism suspects (20)	○	○	○	○	○

When it comes to politics in general, do you usually think of yourself as liberal, moderate, or conservative?

- ○ very liberal (1)
- ○ liberal (2)
- ○ somewhat liberal (3)
- ○ moderate (4)
- ○ somewhat conservative (5)
- ○ conservative (6)
- ○ very conservative (7)

In general, I consider myself a:

- ○ Democrat (1)
- ○ Republican (2)
- ○ Libertarian (3)
- ○ Other (4)

When it comes to politics in general, do you usually think of yourself as liberal, moderate, conservative or something else?

Very Liberal 1	Liberal 2	Somewhat Liberal 3	Moderate 4	Somewhat Conservative 5	Conservative 6	Very Conservative 7

On social issues, you consider yourself to be:

Very Liberal	Liberal	Somewhat Liberal	Moderate	Somewhat Conservative	Conservative	Very Conservative
1	2	3	4	5	6	7

On foreign policy issues, you consider yourself to be:

Very Liberal	Liberal	Somewhat Liberal	Moderate	Somewhat Conservative	Conservative	Very Conservative
1	2	3	4	5	6	7

On economic issues, you consider yourself to be:

Very Liberal	Liberal	Somewhat Liberal	Moderate	Somewhat Conservative	Conservative	Very Conservative
1	2	3	4	5	6	7

Emotionality Measures

Domain Specific Risk Taking (Blais & Weber, 2006)

Blais, A. & Weber, E. U. (2006). A domain-specific risk-taking (DOSPERT) scale for adult populations. *Judgment and Decision Making*, 1(1): 33-47.

Risk Perception

People often see some risk in situations that contain uncertainty about what the outcome or consequences will be and for which there is the possibility of negative consequences. However, riskiness is a very personal and intuitive notion, and we are interested in your gut level assessment of how risky each situation or behavior is. For each of the following statements, please indicate how risky you perceive each situation. Provide a rating from Not at all Risky to Extremely Risky, using the following scale:

1 Not at all Risky 2 Slightly Risky 3 Somewhat Risky 4 Moderately Risky 5 Risky 6 Very Risky 7Extremely Risky

Expected Benefits

For each of the following statements, please indicate the benefits you would obtain from each situation. Provide a rating from 1 to 7, using the following scale:

1 No Benefits at all 2 3 4 Moderate Benefits 5 6 7 Great Benefits

Items

1.Admitting that your tastes are different from those of a friend. (S)

2.Going camping in the wilderness. (R)

3.Betting a day's income at the horse races. (F/G)

4.Investing 10% of your annual income in a moderate growth diversified fund. (F/I)

5.Drinking heavily at a social function. (H/S)

6.Taking some questionable deductions on your income tax return. (E)

7.Disagreeing with an authority figure on a major issue. (S)

8.Betting a day's income at a high-stake poker game. (F/G)

9.Having an affair with a married man/woman. (E)

10.Passing off somebody else's work as your own. (E)

11.Going down a ski run that is beyond your ability. (R)

12.Investing 5% of your annual income in a very speculative stock. (F/I)

13.Going whitewater rafting at high water in the spring. (R)

14.Betting a day's income on the outcome of a sporting event (F/G)

15.Engaging in unprotected sex. (H/S)

16.Revealing a friend's secret to someone else. (E)

17.Driving a car without wearing a seat belt. (H/S)

18.Investing 10% of your annual income in a new business venture. (F/I)

19.Taking a skydiving class. (R)

20.Riding a motorcycle without a helmet. (H/S)

21.Choosing a career that you truly enjoy over a more secure one. (S)

22.Speaking your mind about an unpopular issue in a meeting at work. (S)

23.Sunbathing without sunscreen. (H/S)

24.Bungee jumping off a tall bridge. (R)

25.Piloting a small plane. (R)

26.Walking home alone at night in an unsafe area of town. (H/S)

27.Moving to a city far away from your extended family. (S)

28.Starting a new career in your mid-thirties. (S)

29.Leaving your young children alone at home while running an errand. (E)

30.Not returning a wallet you found that contains $200. (E)

Note. E = Ethical, F = Financial, H/S = Health/Safety, R = Recreational, and S = Social.

Toronto Alexithymia Scale

Bagby, R. M., Parker, J. D. A. & Taylor, G. J. (1994). The twenty-item Toronto Alexithymia Scale-I. Item selection and cross-validation of the factor structure. Journal of Psychosomatic Research, 38, 23-32.

TAS – 20

Using the scale provided as a guide, indicate how much you agree or disagree with each of the following statements by circling the appropriate number. Circle only one number for each statement.

1 = STRONGLY DISAGREE
2 = MODERATELY DISAGREE
3 = NEITHER DISAGREE NOR AGREE
4 = MODERATELY AGREE
5 = STRONGLY AGREE

1.	I am often confused about what emotion I am feeling.	1.	1	2	3	4	5
2.	It is difficult for me to find the right words for my feelings.	2.	1	2	3	4	5
3.	I have physical sensations that even doctors don't understand.	3.	1	2	3	4	5
4.	I am able to describe my feelings easily.	4.	1	2	3	4	5
5.	I prefer to analyze problems rather than just describe them.	5.	1	2	3	4	5
6.	When I am upset, I don't know if I am sad, frightened, or angry.	6.	1	2	3	4	5
7.	I am often puzzled by sensations in my body.	7.	1	2	3	4	5
8.	I prefer to just let things happen rather than to understand why they turned out that way.	8.	1	2	3	4	5
		9.	1	2	3	4	5
9.	I have feelings that I can't quite identify.	10.	1	2	3	4	5
10.	Being in touch with emotions is essential.						
11.	I find it hard to describe how I feel about people.	11.	1	2	3	4	5
12.	People tell me to describe my feelings more.	12.	1	2	3	4	5
13.	I don't know what's going on inside me.	13.	1	2	3	4	5
14.	I often don't know why I am angry.	14.	1	2	3	4	5
15.	I prefer talking to people about their daily activities rather than their feelings	15.	1	2	3	4	5
16.	I prefer to watch "light" entertainment shows rather than psychological dramas.	16.	1	2	3	4	5
17.	It is difficult for me to reveal my innermost feelings, even to close friends.	17.	1	2	3	4	5
18.	I can feel close to someone, even in moments of silence.	18.	1	2	3	4	5
19.	I find examination of my feelings useful in solving personal problems.	19.	1	2	3	4	5
20.	Looking for hidden meanings in movies or plays distracts from their enjoyment.	20.	1	2	3	4	5

Highly Sensitive Persons Scale (Pluess, 2018)

Pluess, M., Assary, E., Lionetti, F., Lester, K. J., Krapohl, E., Aron, E. N., & Aron, A. (2018). Environmental sensitivity in children: Development of the Highly Sensitive Child Scale and identification of sensitivity groups. *Developmental psychology*, 54(1), 51.

1. I find it unpleasant to have a lot going on at once
2. Some music can make me really happy
3. I love nice tastes
4. Loud noises make me feel uncomfortable
5. I am annoyed when people try to get me to do too many things at once
6. I notice it when small things have changed in my environment
7. I get nervous when I have to do a lot in little time
8. I love nice smells
9. I don't like watching TV programs that have a lot of violence in them
10. I don't like loud noises
11. I don't like it when things change in my life

12 When someone observes me, I get nervous. This makes me perform worse than normal.

The Positive and Negative Affectivity Scale Questionnaire (PANAS; Watson, Clark, & Tellegan, 1988)

Watson D., Clark, L. A., & Tellegan, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54(6): 1063-1070.

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate to what extent you feel this way right now, that is, at the present moment OR indicate the extent you have felt this way over the past week (circle the instructions you followed when taking this measure)

Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely
1	2	3	4	5

_____ 1. Interested

_____ 2. Distressed

_____ 3. Excited

_____ 4. Upset

_____ 5. Strong

_____ 6. Guilty

_____ 7. Scared

_____ 8. Hostile

_____ 9. Enthusiastic

_____ 10. Proud

_____ 11. Irritable

_____ 12. Alert

_____ 13. Ashamed

_____ 14. Inspired

_____ 15. Nervous

_____ 16. Determined

_____ 17. Attentive

_____ 18. Jittery

_____ 19. Active

_____ 20. Afraid

Tybur 3 Domain Disgust Questionnaire (Tybur, 2009)

Tybur, J. M., Lieberman, D., & Griskevicius, V. (2009). Microbes, mating, and morality: Individual differences in three functional domains of disgust. *Journal of Personality and Social Psychology*, *97*: 103–122.

The following items describe a variety of concepts. Please rate how *disgusting* you find the concepts described in the items, where 0 means that you do not find the concept disgusting at all and 6 means that you find the concept extremely disgusting.

	Not at all disgusting						Extremely disgusting
1. Shoplifting a candy bar from a convenience store	0	1	2	3	4	5	6
2. Hearing two strangers having sex	0	1	2	3	4	5	6
3. Stepping on dog poop	0	1	2	3	4	5	6
4. Stealing from a neighbor	0	1	2	3	4	5	6
5. Performing oral sex	0	1	2	3	4	5	6
6. Sitting next to someone who has red sores on their arm	0	1	2	3	4	5	6
7. A student cheating to get good grades	0	1	2	3	4	5	6
8. Watching a pornographic video	0	1	2	3	4	5	6
9. Shaking hands with a stranger who has sweaty palms	0	1	2	3	4	5	6
10. Deceiving a friend	0	1	2	3	4	5	6
11. Finding out that someone you don't like has sexual fantasies about you	0	1	2	3	4	5	6
12. Seeing some mold on old leftovers in your refrigerator	0	1	2	3	4	5	6
13. Forging someone's signature on a legal document	0	1	2	3	4	5	6
14. Bringing someone you just met back to your room to have sex	0	1	2	3	4	5	6
15. Standing close to a person who has body odor	0	1	2	3	4	5	6
16. Cutting to the front of a line to purchase the last few tickets to a show	0	1	2	3	4	5	6
17. A stranger of the opposite sex intentionally rubbing your thigh in an elevator	0	1	2	3	4	5	6
18. Seeing a cockroach run across the floor	0	1	2	3	4	5	6
19. Intentionally lying during a business transaction	0	1	2	3	4	5	6
20. Having anal sex with someone of the opposite sex	0	1	2	3	4	5	6
21. Accidentally touching a person's bloody cut	0	1	2	3	4	5	6

Revised SocioSexual Orientation Inventory (Penke & Asendorpf, 2008)

Penke, L., & Asendorpf, J. B. (2008). Beyond global sociosexual orientations: A more differentiated look at sociosexuality and its effects on courtship and romantic relationships. *Journal of Personality and Social Psychology, 95*, 1113-1135.

Appendix

The Revised Sociosexual Orientation Inventory (SOI–R)

Please respond honestly to the following questions:

1. With how many different partners have you had sex within the past 12 months?

□	□	□	□	□	□	□	□	□
0	1	2	3	4	5–6	7–9	10–19	20 or more

2. With how many different partners have you had sexual intercourse on *one and only one* occasion?

□	□	□	□	□	□	□	□	□
0	1	2	3	4	5–6	7–9	10–19	20 or more

3. With how many different partners have you had sexual intercourse without having an interest in a long-term committed relationship with this person?

□	□	□	□	□	□	□	□	
0	1	2	3	4	5–6	7–9	10–19	20 or more

4. Sex without love is OK.

□	□	□	□	□	□	□	□	□
1	2	3	4	5	6	7	8	9
Strongly disagree								Strongly agree

5. I can imagine myself being comfortable and enjoying "casual" sex with different partners.

□	□	□	□	□	□	□	□	□
1	2	3	4	5	6	7	8	9
Strongly disagree								Strongly agree

6. I do *not* want to have sex with a person until I am sure that we will have a long-term, serious relationship.

□	□	□	□	□	□	□	□	□
1	2	3	4	5	6	7	8	9
Strongly disagree								Strongly agree

7. How often do you have fantasies about having sex with someone with whom you do *not* have a committed romantic relationship?

□ 1 – never
□ 2 – very seldom
□ 3 – about once every two or three months
□ 4 – about once a month
□ 5 – about once every two weeks
□ 6 – about once a week
□ 7 – several times per week
□ 8 – nearly every day
□ 9 – at least once a day

8. How often do you experience sexual arousal when you are in contact with someone with whom you do *not* have a committed romantic relationship?

□ 1 – never
□ 2 – very seldom
□ 3 – about once every two or three months
□ 4 – about once a month
□ 5 – about once every two weeks
□ 6 – about once a week
□ 7 – several times per week
□ 8 – nearly every day
□ 9 – at least once a day

9. In everyday life, how often do you have spontaneous fantasies about having sex with someone you have just met?

□ 1 – never
□ 2 – very seldom
□ 3 – about once every two or three months
□ 4 – about once a month
□ 5 – about once every two weeks
□ 6 – about once a week
□ 7 – several times per week
□ 8 – nearly every day
□ 9 – at least once a day

Items 1–3 should be coded as 0 = 1, 1 = 2, . . . , 10–19 = 8, 20 or more = 9; they can then be aggregated to form the Behavior facet. After Item 6 is reverse coded, Items 4–6 can be aggregated to form the Attitude facet. Aggregating Items 7–9 results in the Desire facet. Finally, all nine items can be aggregated as the total score of global sociosexual orientation.

When Items 1–3 are presented with open response format instead of the rating scales, Items 2, 4, and 7 of the original SOI (Table 1) can be added to the SOI–R to allow for calculating the SOI total score in addition to the SOI–R scores. In this case, the open responses should be recoded to the rating scale format (i.e., 0 = 1, 1 = 2, . . . , 20 to max = 9) before the SOI–R scores are determined.

Alternatively, we also developed a version of the SOI–R with 5-point rating scales, which might be more appropriate for samples with less educated or less test-experienced participants. In this version, the scale alternatives are *0*, *1*, *2–3*, *4–7*, and *8 or more* for the Behavior items, 1 (*strongly disagree*) to 5 (*strongly agree*) for the Attitude items, and *never*, *very seldom*, *about once a month*, *about once a week*, and *nearly every day* for the Desire items. In a large, heterogeneous online sample (N = 8,549), the SOI–R with five response alternatives per item achieved good internal consistencies (α = .83, .81, .82, and .85 for the total score and the facets Behavior, Attitude, and Desire, respectively). Further information on the S01-R can be found at www.larspenke.eu/soi-r

Mental Health Measures

Patient Health Questionnaire (PHQ-9; Kroenke & Spitzer, 2002)

Kroenke K., Spitzer R.L. (2002). The PHQ-9: a new depression and diagnostic severity measure. *Psychiatr Ann*, 32: 509-21.

(Note: The question about suicide has been deleted).

Over the last 2 weeks, how often have you been bothered by any of the following problems? (0 = not at all; several days = 1; More than half the days = 2; Nearly every day = 3)

1. Little interest or pleasure in doing things
2. Feeling down, depressed, or hopeless
3. Trouble falling or staying asleep, or sleeping too much
4. Feeling tired or having little energy
5. Poor appetite or overeating
6. Feeling bad about yourself/failure
7. Trouble concentrating on things
8. Moving or speaking so slowly that other people could have noticed. Or being fidgety/restless.

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

PAI-BOR (Morey, 1991)

Morey, L. C. (1991). *Personality Assessment Inventory: Professional Manual.* Odessa, FL: Psychological Assessment Resources.

Read each statement and decide if it is an accurate statement about you. Circle your answer after each statement.

False, not at all true – F Slightly True – ST Mainly True – MT Very True - VT

1. My mood can shift quite suddenly.	F	ST	MT	VT
2. My attitude about myself changes a lot.	F	ST	MT	VT
3. My relationships have been stormy.	F	ST	MT	VT
4. My moods get quite intense.	F	ST	MT	VT
5. Sometimes I feel terribly empty inside.	F	ST	MT	VT
6. I want to let certain people know how much they've hurt me.	F	ST	MT	VT
7. My mood is very steady.	F	ST	MT	VT
8. I worry a lot about other people leaving me.	F	ST	MT	VT
9. People once close to me have let me down.	F	ST	MT	VT
10. I have little control over my anger.	F	ST	MT	VT
11. I often wonder what I should do with my life.	F	ST	MT	VT
12. I rarely feel very lonely.	F	ST	MT	VT
13. I sometimes do things so impulsively that I get into trouble.	F	ST	MT	VT
14. I've always been a pretty happy person.	F	ST	MT	VT
15. I can't handle separation from those close to me very well.	F	ST	MT	VT
16. I've made some real mistakes in the people I've picked as friends.	F	ST	MT	VT
17. When I'm upset, I typically do something to hurt myself.	F	ST	MT	VT
18. I've had times when I was so mad I couldn't do enough to express my anger.	F	ST	MT	VT
19. I don't get bored very easily.	F	ST	MT	VT
20. Once someone is my friend, we stay friends.	F	ST	MT	VT
21. I'm too impulsive for my own good.	F	ST	MT	VT
22. I spend money too easily.	F	ST	MT	VT
23. I'm a reckless person.	F	ST	MT	VT
24. I'm careful about how I spend my money.	F	ST	MT	VT

Family Questionnaire (Felitti, 1997)

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., ... & Marks, J. S. (1997). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American journal of preventive medicine*, *56*(6), 774-786.

Please answer these questions recognitioning back to your childhood using the scale:

1	2	3	4	5
Not at All				Very Often

1. How often did a parent or other adult in the household make you feel that you were loved, supported and cared for?
2. How often did a parent or other adult in the household swear at you, insult you, put you down, or act
3. How often did a parent or other adult in the household express physical affection for you, such as
4. How often did a parent or other adult in the household push, grab, shove, or slap you?
5. How often would you say that a parent or other adult in the household behaved violently toward a
6. How often would you say there as quarreling, arguing, or shouting between your parents?
7. How often would you say there was quarreling, arguing, or shouting between you're a parent and you?
8. How often would you say there was quarreling, arguing, or shouting between a parent and one of
9. How often would you say there was quarreling, arguing, or shouting between your sibling(s) and you?
10. Would you say the household you grew up in was chaotic and disorganized?
11. In your childhood, did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?
12. Would you say that the household you grew up in was well-organized and well-managed?
13. Would you say you were neglected while you were growing up, that is, left on your own to fend for yourself?

Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983)

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of health and social behavior*, 385-396.

0 = Never 1= Almost Never 2=Sometimes 3=Fairly Often 4=Very Often

In the last month:

1. How often have you been upset because of something that happened unexpectedly?
2. How often have you felt that you were unable to control the important things in your life?
3. How often have you felt nervous and "stressed"?
4. How often have you felt confident about your ability to handle your personal problems?
5. How often have you felt that things were going your way?
6. How often have you found that you could not cope with all the things you had to do?
7. How often have you been able to control irritations in your life?
8. How often have you felt that you were on top of things?
9. How often have you been angered because of things that were outside of your control?
10. How often have you felt difficulties were piling up so high that you could not overcome them?